

## Description

# [SET OF GOLF CLUBS WITH CONSISTENT HOSEL OFFSET(Docket Number PU2175)]

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part application of U.S. Patent Application Number 10/063,359, filed on April 15, 2002.

### FEDERAL RESEARCH STATEMENT

[0002] [Not Applicable]

### BACKGROUND OF INVENTION

[0003] Field of the Invention

[0004] The present invention relates to a set of golf clubs. More specifically, the present invention relates to a set of golf clubs having a loft angle ranging from seven degrees to thirty degrees and having a consistent hosel offset.

[0005] Description of the Related Art

[0006] It is desirable to have a golf club that is lightweight, while

offering a wider sole and a lower center of gravity. Such a golf club would allow novice and average golfers to play shots with more ease and reliability and use clubs more suited for shot.

[0007] Various clubs have been designed in an attempt to provide these attributes. One such example is U.S. Patent 5,429,354, issued on July 4, 1995 (the '354 patent). The club in the '354 patent is a crownless golf club having an elongated flange extending from a point on the sole to the striking face. Because of the lightweight face, a composition insert is required to provide low rear weight distribution on the club head to improve the striking quality by reducing the vibration of the metal face and face section.

[0008] Another example is U.S. Patent 5,518,242, issued on May 21, 1996, which is a continuation-in-part of the '354 patent. The crownless club head of the '242 patent utilizes a composition insert secured to the rim of the striking face section composed of titanium or compression molded titanium alloy plates.

[0009] Another example is U.S. Patent 5,746,666, issued on May 5, 1998. This patent provides a club head with a face surface that narrows downwardly toward the sole in conjunc-

tion with a sole surface that extends upwardly toward the top wall thereby reducing contact with the turf and limiting drag resistance.

[0010] Another example is U.S. Patent 6,139,446, issued on October 31, 2000. This patent provides a mass region running linearly from a lip section extending between the striking surface and the top side of the mass region to a point of farthest reach on the top sole section.

[0011] Another example is U.S. Patent 4,836,550, issued on June 6, 1989. This patent is for an iron-type club head having a back wall connected at one end to the sole extending perpendicularly and connected at an opposite striking face at the point of impact.

[0012] An example of a set of golf clubs having progressively offset faces is set forth in U.S. Patent 5,643,102 to Hsien, which discloses a set of golf clubs that have face progressions that progressively increase for each club of the set of golf clubs.

## **SUMMARY OF INVENTION**

[0013] The present invention is directed to golf clubs and a set of golf clubs for the golfer that plays infrequently or has difficulty utilizing current equipment. The golf club of the present invention has increased forgiveness to make the

game of golf more enjoyable for the infrequent golfer.

[0014] One aspect of the present invention is a set of golf clubs including a driver and a plurality of fairway woods having equal hosel offsets as measured from a farthest front portion of the hosel to a farthest front portion of the front wall, and the hosel offset for each is approximately zero. The driver has a body having a hosel, a front wall, a bottom wall extending rearward from a bottom end of the front wall, and a top wall extending rearward from a top end of the front wall. The bottom wall extends a greater distance rearward than the top wall. The front wall, the bottom wall and the top wall define an open cavity. The driver has a loft angle ranging from 7 degrees to 18 degrees and the driver has a moment of inertia through the lzz axis of the center of gravity of at least 2900 grams centimeter squared. Each of the plurality of fairway woods has a body having a hosel, a front wall, a bottom wall extending rearward from a bottom end of the front wall, and a top wall extending rearward from a top end of the front wall. The bottom wall extends a greater distance rearward than the top wall, the front wall, the bottom wall and the top wall defining an open cavity. Each of the fairway woods has a loft angle ranging from 19 degrees to 30 de-

grees and each of the fairway woods has a moment of inertia through the Izz axis of the center of gravity of at least 2900 grams centimeter squared.

[0015] Additionally, the set of golf clubs could have an equal face progression as measured from a center line of the hosel to the farthest front portion of the front wall.

[0016] Another aspect of the present invention is a set of golf clubs including a driver and a plurality of fairway woods that have an equal face progression as measured from a center line of the hosel to a farthest front portion of the front wall. The driver has a body having a hosel, a front wall, a bottom wall extending rearward from a bottom end of the front wall, and a top wall extending rearward from a top end of the front wall. The bottom wall extends a greater distance rearward than the top wall. The front wall, the bottom wall and the top wall define an open cavity. The driver has a loft angle ranging from 7 degrees to 18 degrees and the driver has a moment of inertia through the Izz axis of the center of gravity of at least 2900 grams centimeter squared. Each of the plurality of fairway woods has a body having a hosel, a front wall, a bottom wall extending rearward from a bottom end of the front wall, and a top wall extending rearward from a top

end of the front wall. The bottom wall extends a greater distance rearward than the top wall, the front wall, the bottom wall and the top wall defining an open cavity. Each of the fairway woods has a loft angle ranging from 19 degrees to 30 degrees and each of the fairway woods has a moment of inertia through the Izz axis of the center of gravity of at least 2900 grams centimeter squared.

[0017] Another aspect of the present invention is a set of golf clubs including a driver, a plurality of fairway woods and a plurality of irons that have a face progression of approximately zero as measured from a center line of the hosel to a farthest front portion of the front wall.

[0018] Yet another aspect of the present invention is a set of golf clubs including a driver and a plurality of fairway woods that have an equal face progression as measured from a center line of the hosel to a farthest front portion of the front wall. A body of the driver has a volume greater than 300 cubic centimeters and a body of each of the fairway woods has a volume less than 300 cubic centimeters.

#### **BRIEF DESCRIPTION OF DRAWINGS**

[0019] FIG. 1 is a top perspective view of a driver club head of the present invention.

[0020] FIG. 2 is a front view of the driver club head of FIG. 1.

- [0021] FIG. 3 is a rear view of the driver club head of FIG. 1.
- [0022] FIG. 4 is a top plan view of the driver club head of FIG. 1.
- [0023] FIG. 5 is a bottom view of the driver club head of FIG. 1.
- [0024] FIG. 6 is a heel side view of the driver club head of FIG. 1.
- [0025] FIG. 7 is a toe side view of the driver club head of FIG. 1.
- [0026] FIG. 8 is a cross sectional view of the driver club head taken along lines 8–8 of FIG. 2.
- [0027] FIG. 9 is a top perspective view of a fairway wood club head of the present invention.
- [0028] FIG. 10 is a front view of the fairway wood club head of FIG. 9.
- [0029] FIG. 11 is a rear view of the fairway wood club head of FIG. 9.
- [0030] FIG. 12 is a top plan view of the fairway wood club head of FIG. 9.
- [0031] FIG. 13 is a bottom view of the fairway wood club head of FIG. 9.
- [0032] FIG. 14 is a heel side view of the fairway wood club head of FIG. 9.
- [0033] FIG. 15 is a toe side view of the fairway wood club head of FIG. 9.

- [0034] FIG. 16 is a cross sectional view of the fairway wood club head taken along lines 16–16 of FIG. 10.
- [0035] FIG. 17 is a top perspective view of an iron club head of the present invention.
- [0036] FIG. 18 is a front view of the iron club head of FIG. 1.
- [0037] FIG. 19 is a rear view of the iron club head of FIG. 1.
- [0038] FIG. 20 is a top plan view of the iron club head of FIG. 1.
- [0039] FIG. 21 is a bottom view of the iron club head of FIG. 1.
- [0040] FIG. 22 is a heel side view of the iron club head of FIG. 1.
- [0041] FIG. 23 is a toe side view of the iron club head of FIG. 1.
- [0042] FIG. 24 is a cross sectional view of the iron club head taken along lines 24–24 of FIG. 18.
- [0043] FIG. 25 is a Table of the center of gravity location and the moment of inertia for a preferred set of golf clubs.

#### **DETAILED DESCRIPTION**

- [0044] FIGS. 1–8 illustrate a driver club head of the set of golf clubs, FIGS. 9–16 illustrate a fairway wood club head of the set of golf clubs, and FIGS. 17–24 illustrate an iron club head of the set of golf clubs. In a preferred embodiment, each of the club heads of the set of golf clubs has a consistent face progression and a consistent hosel offset.



[0045] A golf club head is generally designated 20. The golf club head 20 has a body 22 preferably composed of a stainless steel, a titanium alloy, other steel alloys, and the like. The body 22 is preferably cast using a technique such as a lost-wax method, however, it may be alternatively composed of forged or formed pieces.

[0046] In a preferred embodiment, the body 22 is generally composed of a front wall 24, a bottom wall 26, a ribbon wall 28, a top wall 30 and a hosel 32. The ribbon wall is preferably partitioned into a rear ribbon wall 28a, a toe ribbon wall 28b and a heel ribbon wall 28c. The hosel 32 is located at a heel end 34 of the club head 20 which is opposite of a toe end 33 of the club head 20.

[0047] The front wall 24 has a striking surface 36, which is intended to impact a golf ball during a golf swing. The striking surface 36 of the front wall 24 preferably has a plurality of scorelines 38 thereon for increasing friction with a golf ball during impact. The front wall 24 preferably has a thickness that ranges from 0.050 inch to 0.200 inch, more preferably from 0.080 inch to 0.150 inch, and most preferably 0.095 inch to 0.120 inch. The thickness of the front wall 24 is preferably uniform. Alternatively, the front wall 24 has variable thickness such as disclosed

in U.S. Patent Number 5,830,084, U.S. Patent Number 6,368,234, and U.S. Patent Number 6,398,666, which are hereby incorporated by reference for the driver and fairway wood club heads 20 of FIGS. 1-16, and such as disclosed in U.S. Patent Number 5,971,868 which is hereby incorporated by reference for the iron club head 20 of FIGS. 17-24.

[0048] The bottom wall 26 has a sole surface 40 that contacts the ground during a golfer's swing. The sole surface 40 may have graphics and other indicia thereon. The bottom wall has a thickness that ranges from 0.025 inch to 0.150 inch, and more preferably from 0.040 inch to 0.100 inch. The bottom wall 26 is preferably uniform in thickness. Alternatively the bottom wall 26 has a tapered thickness that decreases in thickness from the front wall 24 toward the rear ribbon wall 28a.

[0049] In a preferred embodiment, the body 22 has an open cavity 50 that is defined by the front wall 24, the bottom 26, the ribbon wall 28 and the top wall 30. In conventional drivers and fairway woods, a crown would cover such an open cavity, adding weight to the club head and raising the center of gravity of the club head. However, the absence of a crown, and thus the open cavity 50 allows for

the lowering of the center of gravity of the club heads 20. The top wall 30 act as a partial crown, covering a relatively small portion of the open cavity 50, preferably less 33% of the open cavity 50. The top wall 30 adds to support to the front wall 24 during impact with a golf ball and also visually assists a golfer during a swing. In order to assist a golfer in striking the center of the striking surface 36 during impact, an indicia 51 indicates the center of the striking surface 36. The top wall 30 preferably has a thickness that ranges from 0.025 inch to 0.150 inch, and more preferably from 0.040 inch to 0.100 inch. The top wall 30 is preferably uniform in thickness. Alternatively the top wall 30 has a tapered thickness that decreases in thickness from the front wall 24 rearward.

[0050] An interior sole surface 52 and an interior ribbon surface 54 are exposed through the open cavity 50. A perimeter is formed around the open cavity 50 through a top wall edge 56 and a ribbon wall edge 58.

[0051] The club head 20 preferably has an offset hosel 32. A shaft (not shown) is placed within a bore 44 that is defined by a hosel wall 42. As defined on page 514 of *Golf Club Design, Fitting, Alternation & Repair, The Principles & Procedures*, by Ralph Maltby, Ralph Maltby Enterprises, Inc. (4<sup>th</sup>

Edition 1995), the Hosel Offset is the distance from the farthest front portion of the hosel to the farthest front portion of the face on its centerline, and the Face Progression is defined as the distance from the centerline of the shaft or hosel bore to the farthest front portion of the face on its centerline. As shown in FIG. 7 for a driver, in FIG. 15 for a fairway wood and FIG. 23 for an iron, the hosel offset, the distance from the farthest front portion of the hosel 32 to the farthest front portion 41 of the front wall 24 is preferably zero. The face progression from the centerline of the hosel bore 44 is preferably rearward of the front wall 24.

[0052] In a preferred embodiment, the driver club head 20 of FIGS. 1–8 has a loft angle of 15 degrees to 18 degrees, most preferably 18 degrees. The lie angle is preferably 56 degrees to 58 degrees. The mass of the driver club head 20 is preferably 180 grams to 250 grams, and most preferably 217 grams.

[0053] As shown in FIG. 5, the driver club head 20 has a length,  $L_s$ , that preferably ranges from 2.75 inches to 3.50 inches, and more preferably from 3.0 inches to 3.25 inches. As shown in FIG. 2, the driver club head has a face width,  $W_f$ , that ranges from 2.75 inches to 4.50 inches,

more preferably 3.00 inches to 3.75 inches, and most preferably from 3.20 inches to 3.5 inches, and a face height, Hf, that preferably ranges from 1.50 inches to 2.00 inches, and more preferably from 1.60 inches to 1.80 inches.

[0054] The driver club head 20 preferably has a bulge radius ranging from 16 inches to 24 inches, more preferably from 18 inches to 22 inches, and most preferably 20 inches. The driver club head 20 preferably has a roll radius ranging from 7 inches to 14 inches, more preferably from 8 inches to 12 inches, and most preferably 10 inches. For the driver embodiment, the face progression from the centerline of the hosel bore 44 to the front edge 41 preferably ranges from 0.250 inch to 0.400 inch, and is most preferably 0.280 inch.

[0055] The top wall 30 of the driver embodiment preferably has a thickness that ranges from 0.090 inch to 0.170 inch, and more preferably from 0.100 inch to 0.150 inch. The top wall 30 is preferably uniform in thickness. Alternatively the top wall 30 has a tapered thickness that decreases in thickness from the center outward toward the heel end 34 and the toe end 33 of the golf club head 20. The bottom wall 26 of the driver embodiment preferably has a thick-

ness that ranges from 0.040 inch to 0.100 inch, and more preferably from 0.045 inch to 0.055 inch. The bottom wall 26 is preferably uniform in thickness. Alternatively the bottom wall 26 has a tapered thickness that decreases in thickness from the center outward toward the heel end 34 and the toe end 33 of the golf club head 20. The ribbon wall 28 preferably has a thickness that ranges from 0.045 inch to 0.055 inch near the bottom wall 26, thickening upward with a thickness of the edge 58 of preferably 0.140 inch. The front wall 24 of the driver embodiment preferably has a thickness that ranges from 0.060 inch to 0.150 inch, and more preferably from 0.090 inch to 0.100 inch. The front wall 24 of the iron embodiment is preferably uniform in thickness, however, as mentioned above, it may have variable thickness.

[0056] In a preferred embodiment, the fairway wood club head 20 of FIGS. 9–16 has a loft angle of 18 degrees to 30 degrees. The lie angle is preferably 56 degrees to 60 degrees. The mass of the fairway wood club head 20 is preferably 200 grams to 300 grams, most preferably ranges from 220 grams to 245 grams.

[0057] As shown in FIG. 13, the fairway wood club head 20 has a length,  $L_s$ , that preferably ranges from 2.75 inches to

3.50 inches, and more preferably from 3.0 inches to 3.25 inches. As shown in FIG. 10, the fairway wood club head has a face width,  $W_f$ , that ranges from 2.50 inches to 4.25 inches, more preferably 2.75 inches to 3.50 inches, and most preferably from 3.00 inches to 3.30 inches and a face height,  $H_f$ , that preferably ranges from 1.25 inches to 2.00 inches, and more preferably from 1.40 inches to 1.75 inches.

[0058] The fairway wood club head 20 preferably has a bulge radius ranging from 16 inches to 24 inches, more preferably from 18 inches to 22 inches, and most preferably 20 inches. The fairway wood club head 20 preferably has a roll radius ranging from 7 inches to 14 inches, more preferably from 8 inches to 13 inches, and most preferably 12 inches. For the fairway wood embodiment, the face progression from the centerline of the hosel bore 44 to the front edge 41 preferably ranges from 0.250 inch to 0.400 inch, and is most preferably 0.270 inch.

[0059] The top wall 30 of the fairway wood embodiment preferably has a thickness that ranges from 0.090 inch to 0.170 inch, and more preferably from 0.100 inch to 0.155 inch. The top wall 30 is preferably uniform in thickness. Alternatively the top wall 30 has a tapered thickness that de-

creases in thickness from the center outward toward the heel end 34 and the toe end 33 of the golf club head 20. The bottom wall 26 of the fairway wood embodiment preferably has a thickness that ranges from 0.040 inch to 0.100 inch, and more preferably from 0.060 inch to 0.080 inch. The bottom wall 26 is preferably uniform in thickness. Alternatively the bottom wall 26 has a tapered thickness that decreases in thickness from the center outward toward the heel end 34 and the toe end 33 of the golf club head 20. The ribbon wall 28 preferably has a thickness that ranges from 0.070 inch to 0.080 inch near the bottom wall 26, thickening upward with a thickness of the edge 58 of preferably 0.160 inch. The front wall 24 of the fairway wood embodiment preferably has a thickness that ranges from 0.060 inch to 0.150 inch, and more preferably from 0.100 inch to 0.110 inch. The front wall 24 of the iron embodiment is preferably uniform in thickness, however, as mentioned above, it may have variable thickness.



TABLE ONE

Model	5-Wood	7-Wood	9-Wood
Face Progression (in.)	0.270	0.270	0.270
Loft (deg.)	18	21	24
Lie (deg.)	58.5	59	59.5
Hosel Offset	0	0	0
Face Angle	2° closed	2° closed	2° closed
Head Mass (g)	220	226	232

[0061] As illustrated in Table One, each fairway wood of the set of golf clubs has a hosel offset of zero degrees. Further, each of the fairway woods of the set of golf clubs has the same face progression, 0.270 inches.

[0062] In a preferred embodiment, the iron club head 20 of FIGS. 17–24 has a loft angle of 29 degrees to 60 degrees, most preferably 35 degrees for a long iron, 45 degrees for a mid-iron and 55 degrees for a short iron. The lie angle is preferably 60 degrees to 65 degrees, and most preferably 63 degrees. The mass of the iron club head 20, is preferably 220 grams to 320 grams, most preferably 247 grams for a long iron, 266 grams for a mid-iron and 300 grams for a short iron.

[0063] As shown in FIG. 21, the iron club head 20 has a length,  $L_s$ , that preferably ranges from 2.0 inches to 3.0 inches, and more preferably ranges from 2.25 inches to 2.50

inches. As shown in FIG. 18, the iron club head has a face width,  $W_f$ , that ranges from 3.00 inches to 3.50 inches, and more preferably ranges from 3.10 inches to 3.30 inches, and a face height,  $H_f$ , that preferably ranges from 1.30 inches to 1.70 inches, and more preferably ranges from 1.40 inches to 1.65 inches. The face progression from the centerline of the hosel bore 44 to the front edge 41 preferably ranges from 0.270 inch to 0.400 inch, and is most preferably 0.370 inch for a long iron, 0.330 inch for a mid-iron and 0.292 inch for a short iron.

[0064] The top wall 30 of the iron embodiment preferably has a thickness that ranges from 0.090 inch to 0.170 inch, and more preferably from 0.100 inch to 0.150 inch. The top wall 30 is preferably uniform in thickness. Alternatively the top wall 30 has a tapered thickness that decreases in thickness from the front wall 24 rearward. The bottom wall 26 of the iron embodiment preferably has a thickness that ranges from 0.050 inch to 0.330 inch, and more preferably from 0.170 inch to 0.280 inch. The bottom wall 26 is preferably uniform in thickness. Alternatively the bottom wall 26 has a tapered thickness that decreases in thickness from the center outward toward the heel end 34 and the toe end 33 of the golf club head 20. The front

wall 24 of the iron embodiment preferably has a thickness that ranges from 0.100 inch to 0.150 inch, and more preferably from 0.105 inch to 0.115 inch. The front wall 24 of the iron embodiment is preferably uniform in thickness, however, as mentioned above, it may have variable thickness.

[0065] FIG. 25 is a table of the position of the center of gravity of a club head 20 and the moment of inertia,  $I_{xx}$ , about the X axis of the golf club head 20, the moment of inertia,  $I_{yy}$ , about the Y axis of the golf club head 20, and the moment of inertia,  $I_{zz}$ , about the Z axis of the golf club head 20. A method for calculating the center of gravity and measuring the moment of inertia is set forth in U.S. Patent Number 6,607,452, entitled High Moment Of Inertia Composite Golf Club, and hereby incorporated by reference in its entirety which is hereby incorporated by reference. The axes of inertia through the center of gravity of the golf club head 20 are designated X, Y and Z. The X axis extends from the front wall 24 through the center of gravity, CG, and to the rear of the golf club head 20. The Y axis extends from the toe end 33 of the golf club head 20 through the center of gravity, CG, and to the heel end 34 of the golf club head 20. The Z axis extends from the bot-

tom wall 26 through the center of gravity, CG, and into the open cavity 50.